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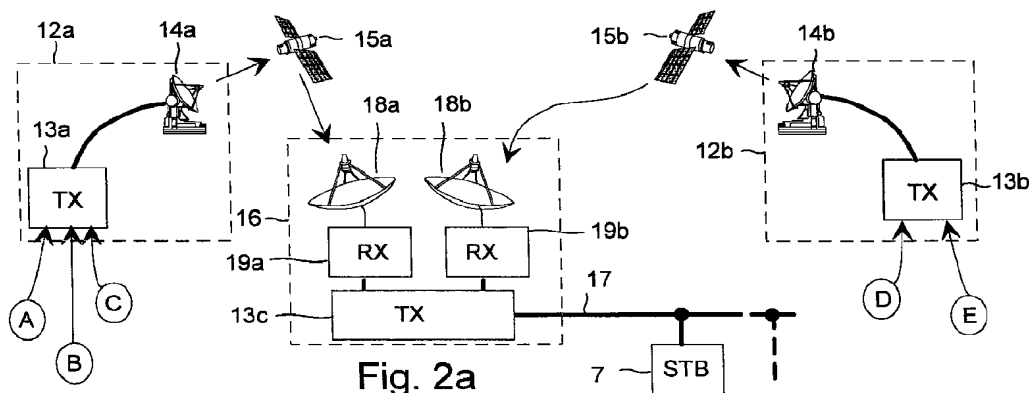
**EP 0 854 650 A2**

(12)

**EUROPEAN PATENT APPLICATION**(43) Date of publication:  
22.07.1998 Bulletin 1998/30(51) Int. Cl.<sup>6</sup>: **H04N 7/24**(21) Application number: **97119962.5**(22) Date of filing: **14.11.1997**(84) Designated Contracting States:  
**AT BE CH DE DK ES FI FR GB GR IE IT LI LU MC  
NL PT SE**(30) Priority: **17.01.1997 FI 970186**(71) Applicant: **NOKIA TECHNOLOGY GmbH  
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33210 Tampere (FI)**(54) **Method for addressing a service in digital video broadcasting**

(57) Method for addressing at least one service in a data communication system comprises at least one data transmission network (6, 12a, 12b, 15a, 15b, 16, 17) for transmitting information in at least one preferably MPEG data transmission stream (TS). In the method one or several service\_providers transmits services to one or several data transmission networks (6, 12a, 12b, 15a, 15b, 16, 17). The service is assigned an identification (original\_network\_id, transport\_stream\_id, service\_id), wherein on basis of the identification (original\_network\_id, transport\_stream\_id, service\_id),

it is possible to retrieve the data transmission stream (TS) to be used and the location in the data transmission stream (TS). The service is assigned an identifying name (service\_provider\_name, service\_name) and a relation between the name information and the identification data, wherein on the basis of the name information (service\_provider\_name, service\_name) and the relation, it is possible to retrieve the service identification.

**EP 0 854 650 A2**

## Description

The present invention relates to methods presented in the preambles of claims 1 and 2 for addressing a service to be transmitted via a digital video broadcast. The invention relates further to data communication systems according to the preambles of claims 10 and 11, broadcasting devices according to the preambles of claims 12 and 13, and receiving apparatuses according to the preambles of claims 14 and 15.

A service refers in this specification to the packet of service components, such as television programs, video programs, radio programs, data files etc. to be transmitted in one data transmission stream. A service component indicates in this context also parts contained in one service component, such as video, audio and data signals, or events, such as different episodes of a television program. The services can be transmitted advantageously in digital form from the sender to the receiver.

For transmission of digital video, audio and data signals, it is possible to use either ground-based broadcasting in the air via an antenna, a satellite connection, a cable television network, a telephone or telecommunication network, or a light cable network, through which digital information is transmitted to a large number of receivers. An advantage of the transmission of digital signals to analog transmission is the fact that the same transmission channel can be used for transferring signals of several different services.

Before analog signals can be transmitted in packet form, the analog signals must first be converted at the sending end to digital form, wherein the digital signal formed can be arranged into packets to be sent via the transmission channel. At the receiving end, the analog signals converted into digital signals are converted back to analog form.

A significant application of transmission of a digital signal in packet form is the digital television system, in which several programs are transmitted simultaneously in one transmission channel. Thus the transmission channel conveys packets containing video, audio and data information of different programs at intervals. An example is the MPEG-2 (Motion Picture Experts Group) (ISO/IEC 13818), which defines a generic standard for information packeting as well as a video and audio compression method, which makes it possible to broadcast a television image with fewer bits than by direct digitizing of the television image to bits.

Figure 1 shows a data communication system in which video, audio and data signals formed of different services are transmitted in the channel to the receiving apparatus. At the sending end, different information types, such as video, audio and data, are preferably formed into packets which are compiled into services, for example with a multiplexer 2. Figure 1 shows the equipment 1a, 1b, 1c, 2 for forming the packet stream of only one service but at the sending end, several different services can be combined in the same data transmission stream. The system of Fig. 1 comprises a service multiplexer 3 for compiling the packets of different services advantageously to a data transmission stream in packet form to be transmitted further. In the advantageous embodiment shown in Fig. 1, the service multiplexer 3 comprises further means for adding to the data transmission stream information on the service, such as service information SI.

The channel coder 5 converts the data transmission stream into a signal suitable for the data transmission channel used at the time, as is known. The data transmission channel 6 is for example a satellite connection, a cable connection, or a ground-based link connection.

For watching digital video signals, receiving apparatuses have been developed which are so-called set-top-box devices (STB). In these STB devices, the received digital video signal is demodulated, possible error correction is conducted for eliminating possible interferences with the signal in the transmission channel, a selection is made from the packet stream to select the packets which belong to the service intended to receive, and possible encryption is deciphered, provided that the viewer has the right to decipher the encryption. After this, the deciphered signal is decoded, i.e. the operation is reverse to the coding of the signal upon transmission, for example coding with the MPEG-2 algorithm. Decoding is conducted both on audio and video signals, wherein the decoder advantageously forms both an audio and a video signal. At this stage, the decoded signals are still in digital form, the audio signal is directed further to the digital/analog converter and the video signal is directed for example to a PAL converter or an NTSC converter depending on which system was used for transmission of color information of the video image. The above-mentioned PAL and NTSC color systems are the most commonly used, but also other color coding systems are known. The block diagram of Fig. 1 is a reduced illustration on the functional blocks of an STB device 7: channel decoder 8, encryption deciphering means 9, and service demultiplexer 10 in which service information is separated from the services and services related to different programs are conveyed as separate signals into the service unpacking means 11a, 11b,

11c for forming the video, audio and data signals corresponding to the transmitted signals. Further, the STB device can comprise means for storing service information.

The audio and video signals formed by the STB device are first directed e.g. to a conventional television set, advantageously to the video or SCART connection of the television set, wherein the received information can be viewed on the television screen.

At the sending end of digital television systems, transmitting servers form digital packets of several programs to be broadcast, which are conveyed to the transmission channel, for example a satellite 15a, 15b (Fig. 2a). The services to be transmitted can include commercial videos, music videos, movies, sports events, current affairs programs, and news. The STB device is capable of selecting from the incoming data transmission stream the service that the viewer wishes to watch. Thus the viewer must give the device an identification of the service in question, or the STB device can make a list of the identifications of the services which can be received with the data transmission stream, for example in the signal transmitted in a cable television network 17.

Data systems developed for transmission of digital video signals can comprise several providers of program services who are located geographically even very far from each other and transmit signals of different services to the data communication system. One data communication system has been defined by the Digital Video Broadcasting (DVB) organization. For separating different services and service providers from each other, this system comprises a naming system in which each data transmission network has an identification code, each data transmission stream within said data transmission network has an identification code, and further the different services transmitted in the data transmission stream each have an identification code. Thus it is not possible for two different services to have a fully identical code. This naming systems is presented in the ETSI standard ETS 300 468.

Thanks to the increased use of open data systems, the Transmission Control Protocol/Internet Protocol (TCP/IP) has become a general protocol which computers of different sizes and brands can use for communication. The TCP/IP support is presently available for almost all operating systems. The TCP/IP has a network layer protocol IP (Internet Protocol) intended for routing by gateways or routers. The routing is conducted with the help of IP addresses and routing tables. Thanks to the Internet protocol, computers using the TCP/IP can transmit messages in the router network as far as to the other side of the globe.

The Internet, which covers well particularly the industrialized countries, is a huge router network using the TCP/IP connection protocol. The largest group of users of the Internet, which was started for scientific use only, now consists of companies which buy their services from commercial connection providers. In the Internet, each computer has its own IP address for identification, for example 123.1.1.10.

In addition to the numerical address presented above, each computer connected with the Internet data transmission network has also an identification name, such as computer.company.fi, which is stored in a name server together with the numerical address. Thus the name server is capable of using the name to find out the actual computer address used by the data transmission network. It is usually easier to remember a name than a numerical string, so the use of a name in the address has become popular. Further, it is usually possible to maintain the name also in a situation where the numerical address is changed, for example when the operator of the data transmission network reconfigures the data transmission network.

Addressing methods of prior art have *inter alia* the disadvantage that when the address of a device connected with the data transmission network is changed, the old address can no longer be used but the new address must be known. A change of address may be necessary for example when the structure of the data transmission network is changed. The address can also be changed in a situation, when e.g. the operator of a cable network receives data transmission streams transmitted via a satellite and sends them further into the cable network, wherein the identifications of the services to be transmitted in the data transmission stream are changed, as shown in Figs. 2a and 2b. Furthermore, a numerical address is difficult to remember. Moreover, a numerical address does not easily reveal what type of service is in question.

One aim of the present invention is to provide a method for addressing a service to be transmitted in a digital video broadcasting, with which it is possible to locate the data transmission stream used for transmitting the information contained in the service.

The first advantageous embodiment of the method according to the present invention is characterized in what will be presented in the characterizing part of the appended claim 1. The first advantageous embodiment of the system according to the present invention is characterized in what will be presented in the characterizing part of the appended claim 10. The first advantageous embodiment of the transmitter according to the present invention is characterized in what will be presented in the characterizing part of the appended claim 12. Finally, the first advantageous embodiment of the receiver according to the present invention is characterized in what will be presented in the characterizing part of the appended claim 14.

The second advantageous embodiment of the method according to the present invention is characterized in what will be presented in the characterizing part of the appended claim 2.

The second advantageous embodiment of the system according to the present invention is characterized in what will be presented in the characterizing part of the appended claim 11.

The second advantageous embodiment of the transmitter according to the present invention is characterized in what will be presented in the characterizing part of the appended claim 13.

The second advantageous embodiment of the receiver according to the present invention is characterized in what will be presented in the characterizing part of the appended claim 15.

The invention gives considerable advantages to the solutions of prior art. The user does not need to know the physical address of the service, but the service can be identified on the basis of an individual name which is remembered more easily.

The invention will be described more closely in the following description with reference to the appended drawings. In the drawings,

Fig. 1 is a reduced block diagram showing a system for transferring digital video signals according to prior art,

Fig. 2a is a chart showing the principle of a data communication system used as an example,

Fig. 2b illustrates the change of service identification data in connection with a relayed transmission,

Figs. 3a-d illustrate the general organization of service information SI and its table hierarchy,

Fig. 4 shows an example of a SDT table in a reduced manner

Fig. 5 is a reduced chart illustrating the method according to an advantageous embodiment of the invention,

Fig. 6 is a reduced chart illustrating the application of the method according to an advantageous embodiment of the invention in retrieving the address of a service, and

Fig. 7 is a reduced chart illustrating another data communication system according to the advantageous embodiment of the invention.

The appended Fig. 2a shows a data communication system in which the present invention can be advantageously applied. Program service providers A, B, C, D, E each send their services to the broadcasting station 12a, 12b of a pro-

vider of program transmission services, which comprises *inter alia* a service transmitter 13a, 13b and means 14a, 14b for sending the data transmission stream to the transmission channel.

The data transmission stream is transmitted from a transmitting antenna 14a, 14b for example to a satellite 15a, 15b. The satellite 15a, 15b transfers the data transmission stream to a ground station 16 which is e.g. a satellite antenna 18a, 18b and a satellite receiver 19a, 19b of the operator of a cable television network 17.

The ground station 16 can comprise several satellite antennas 18a, 18b and satellite receivers 19a, 19b, each being adjusted to receive data transmission streams transmitted via a certain satellite 15a, 15b. The satellites 15a, 15b can belong to the same transmission server, or they can be satellites of different transmission servers 13a, 13b.

Figure 2b shows an example of changing service identification data in connection with relayed transmission. The identification data of a service to be transmitted via a first satellite 15a are shown in block 20. In a corresponding manner, in Fig. 2a the identification data of a service to be transmitted via a second satellite 15a are shown in block 21. Both signals are received at the ground station 16 and transmitted further to the cable television network 17. Thus the service identification data, which in this application example is transmitted together with the service information SI, is converted to comply for example with block 22.

Figure 3a shows a general organization and table hierarchy of service information (DVB SI). The information is given in layers, wherein the first layer presents information on the network, the second layer contains descriptions of services, and the third layer contains information on events. The tables show primarily information which is relevant for applying the present invention and understanding its function. The network can comprise e.g. the transmitting servers 13a, 13b of a certain provider of program transmitting services.

Figure 3b shows an example on the structure of the network information table (NIT) of the first layer.

Figure 3c shows the structure of a service description table SDT.

Service description tables are network-specific, wherein each network has its own service description table.

Figure 3d shows the structure of an event information table EIT.

In the following embodiments describing the invention, an example is made with the DVB data communication system using MPEG data transmission strings for transmission of digital signals, such as audio, video and data signals. As presented above in this specification, a service can be identified e.g. with a numerical address containing the service identification data. In this example, these are `original_network_id`, `transport_stream_id`, and `service_id`. The `original_network_id` is individual throughout the whole data communication system, and in the DVB data communication system, the network identifications are maintained and assigned by the ETSI organization. The `transport_stream_id` is individual within the scope of each network, and the `service_id` refers to one individual program service to be transmitted in the same data transmission stream. Further, the `event_id` is defined individually in each program service.

In the records of the service description table, space is reserved for descriptors for each service defined in the record of the SDT table in which information can be transmitted on said service. In a corresponding manner, the records of the event information table EIT contain a space for transmitting information related to the event in question. The DVB protocol determines what types of descriptors can be used in the records of the SDT table and how the providers of

program services can add their own private descriptors. Each record of the SDT table can contain several of these descriptors advantageously one after the other. The descriptor fields can be either defined by one and the same service provider or by several different service providers, wherein the fields of the same service provider are preferably placed in succession.

Figure 4 is a chart showing in principle how the private descriptors are placed according to the DVB protocol at the end of the SDT table. The beginning of the SDT table (indicated with reference numeral 23) comprises general descriptors, such as a service\_descriptor. Each descriptor comprises a descriptor\_tag, on the basis of which the different descriptors are separated from each other. The private descriptors are preceded by a general descriptor 24, whose type identification is the type of the private descriptor (private\_data\_specifier\_descriptor). This is followed by the descriptors 25 defined by one service provider. The descriptors 27 of the next service provider begin, again, with the general descriptor 26 whose type identification is the type of the private descriptor.

The record to which the descriptor is added is at least a part of the identification data of the service in question, wherein the relation between the name information and the identification data is obvious and the identification data can be found out on the basis of the name information.

Figure 5 shows an advantageous embodiment in which a field is added to the SDT table containing the name of the service provider and the name of the service.

An advantageous definition of the SNS\_addressing\_descriptor is presented below according to the DVB standard:

```

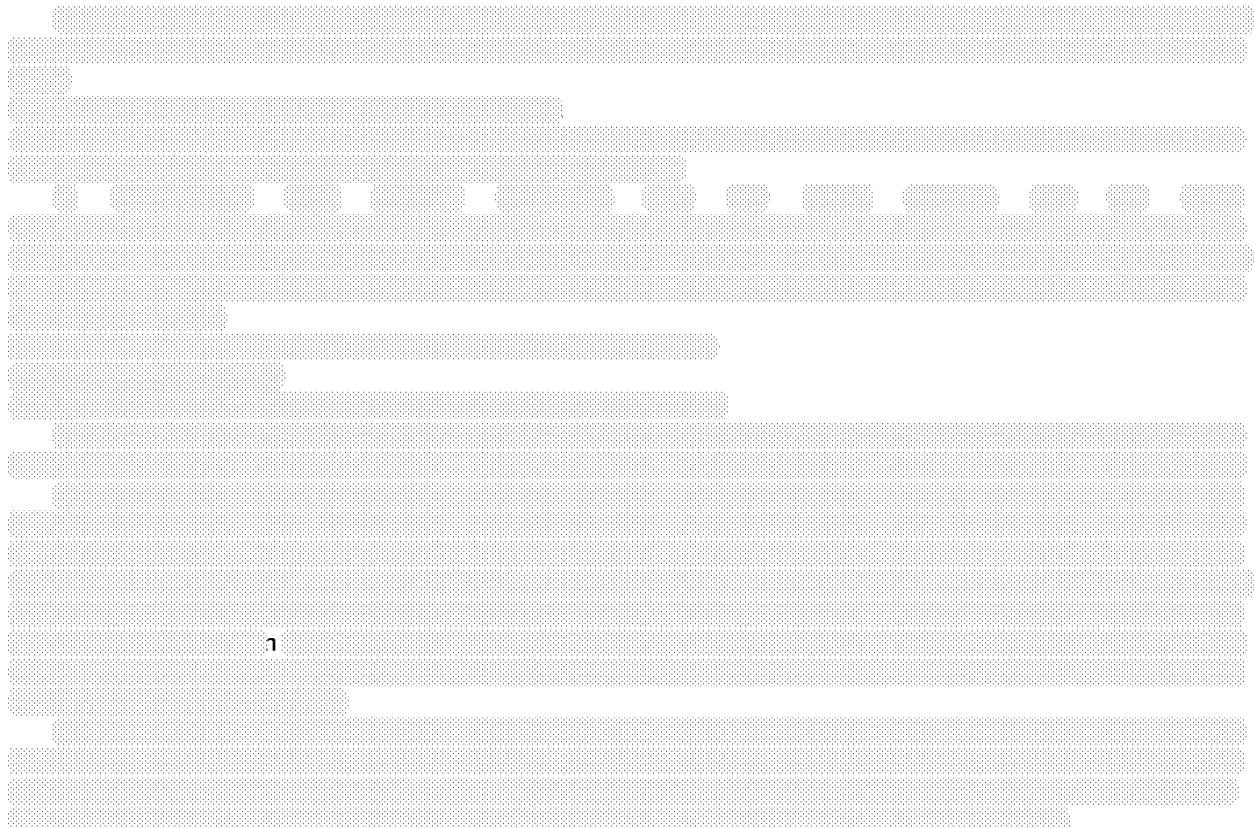
SNS_addressing_descriptor(){
    descriptor_type
    descriptor_length
    service_provider_name_length
    for(i=0; i<N; i++){
        char
    }
    service_name_length
    for(i=0; i<N; i++){
        char
    }
    component_id
}

```

Thus in the field presented above, a space is reserved after the length information on the name of the service provider for the service\_provider\_name, and after the length information on the name of the service for the service\_name in text form. In Fig. 5, the arrows 5/1—5/5b illustrate the relation for retrieving identification data on the basis of the name information. The use of these relations will be described below in an example in connection with the description of Fig. 6.

For ensuring individuality of name information, the names of the service providers must be determined globally in the data transmission network. This can be conducted with the same principle as is known in the Internet data transmission network, i.e. by selecting an organization for keeping a register of names of service providers and determining

new names according to the need.



The following is a description on retrieving the data transmission stream of a service from the name-based address file 28, with reference to Fig. 6. The address file 28 is used for retrieving the service\_provider\_name and the service\_name. These operations are indicated in Fig. 6 with arrows 6/1 and 6/2, respectively. On the basis of this name information, a search is made in service description tables SDT for the information of such a service, in whose descriptor said names are found. When the record describing said service is found, the original\_network\_id and the transport\_stream\_id are retrieved from the field of the SDT table. On the basis of the original\_network\_id and the transport\_stream\_id, a record is retrieved in the network information table NIT in which the transport\_stream\_id and the original\_network\_id match (arrow 6/3). Next, the physical parameters of the data transmission stream, such as carrier\_frequency and symbol\_rate, are retrieved from the NIT table on the basis of the parameters contained in the found record. On the basis of this information, the STB device 7 is tuned to receive the correct data transmission stream. From the PAT table of this data transmission stream, a record is retrieved in which the program\_number is identical with the service\_id contained in the record of the SDT table (arrows 6/4 and 6/5). When the correct service\_id is found, the program\_map\_PID and program\_number contained in the record of the PAT table of the program is used for finding out the correct field in the PMT table (arrows 6/6 and 6/7a).

The record in the PMT table contains information on which identifications of the packets in the data transmission stream are used for service transmission, as well as on parameters related to them. If it is needed to make a reference from a descriptor in the SDT table to a certain packet identification used for transmission of said service component in the data transmission stream, this can be done by using a component\_tag (arrow 6/7b). Thus at said packet identification in the PMT table, there is a descriptor containing the corresponding component\_tag, wherein the packet identification can be found out. If the descriptor in the SDT table does not contain the component\_tag, it is assumed that reference is made to all packet identifications in the data transmission stream which are defined in the PMT table as belonging to said service.

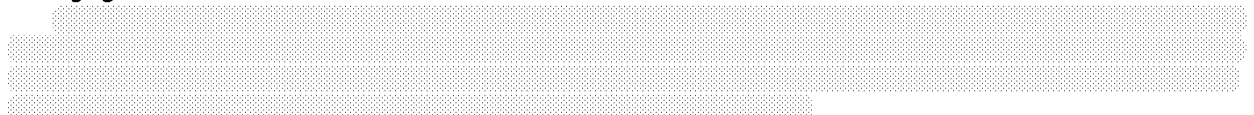


Figure 7 is a reduced chart showing a second data communication system according to the advantageous embodiment of the invention. The difference here to the system of Fig. 2a lies primarily in the fact that in this system, the information on the relation between the identification data and name information is stored in a separate data system, such

as a service name server (SNS) 29 with a data transmission connection e.g. to the STB device 7 of the viewer. Thus the STB device retrieves the relation data for example by means of a modem connection 30 from the service name server or a corresponding storage.

The present invention is not limited solely to the embodiments presented above, but it can be varied within the scope of the appended claims.

## Claims

1. Method for addressing at least one service in a data communication system comprising at least one data transmission network (6, 12a, 12b, 15a, 15b, 16, 17) for transmitting information in at least one preferably MPEG data transmission stream (TS), in which method:
  - one or several service\_providers transmits services to one or several data transmission networks (6, 12a, 12b, 15a, 15b, 16, 17), and
  - the service is assigned an identification (original\_network\_id, transport\_stream\_id, service\_id), wherein on basis of the identification (original\_network\_id, transport\_stream\_id, service\_id), it is possible to retrieve the data transmission stream (TS) to be used and the location in the data transmission stream (TS), **characterized** in that the service is assigned an identifying name (service\_provider\_name, service\_name) and a relation between the name information and the identification data, wherein on the basis of the name information (service\_provider\_name, service\_name) and the relation, it is possible to retrieve the service identification.
2. Method for addressing at least one service and/or service component in a data communication system comprising at least one data transmission network (6, 12a, 12b, 15a, 15b, 16, 17) for transmitting information in at least one preferably MPEG data transmission stream (TS), in which method:
  - the services comprise at least one service component,
  - one or several service\_providers transmits services to one or several data transmission networks (6, 12a, 12b, 15a, 15b, 16, 17),
  - the service is assigned an identification (original\_network\_id, transport\_stream\_id, service\_id) identifying the service, and
  - the service component is assigned an identification (original\_network\_id, transport\_stream\_id, service\_id, event\_id, module\_id, component\_tag) identifying the service component as well as the service to be used for transmitting the service component, wherein the identification data (original\_network\_id, transport\_stream\_id, service\_id, event\_id, module\_id, component\_tag) can serve as a basis for retrieving the data transmission stream (TS) to be used for transmitting the service and the service component, and the location in the data transmission stream (TS), **characterized** in that the service and/or the service component are assigned identifying name information (service\_provider\_name, service\_name) and a relation between the name information and identification data, wherein on the basis of the name information (service\_provider\_name, service\_name) and the relation it is possible to retrieve the identification data of the service and/or the service component.
3. Method according to claim 1 or 2, **characterized** in that the data transmission streams (TS) are data transmission streams complying to the DVB definitions.
4. Method according to claim 3, in which the identification data are transmitted in SDT table records, **characterized** in that the name information is added to the descriptor in the SDT table record, wherein a relation is formed between the name information and the identification data.
5. Method according to claim 3, in which the identification data are transmitted in EIT table records, **characterized** in that the name information is added to the descriptor in the EIT table record, wherein a relation is formed between the name information and the identification data.
6. Method according to any of claims 1 - 5, **characterized** in that the name information comprises the service\_name and the service\_provider\_name.
7. Method according to any of claims 1 - 6, **characterized** in that the service components are files transmitted in the DSM-CC data carousel.



8. Method according to any of claims 1 - 7, **characterized** in that the service components are transmitted in DSM-CC object carousel.

9. Method according to any of claims 1 - 8, **characterized** in that the name information are used as part of the URL address.

10. Data communication system comprising at least one data transmission network (6, 12a, 12b, 15a, 15b, 16, 17) for transmitting information on services in at least one preferably MPEG data transmission stream (TS), which system comprises equipment for transmitting services of one or several service\_providers to one or several data transmission networks (6, 12a, 12b, 15a, 15b, 16, 17), and the service is assigned an identification (original\_network\_id, transport\_stream\_id, service\_id), **characterized** in that the system comprises further:

- means for assigning the service an identifying name (service\_provider\_name, service\_name) and
- means for forming a relation between the name information and the identification data, wherein on the basis of the name information (service\_provider\_name, service\_name) and the relation it is possible to retrieve the service identification.

11. Data communication system comprising at least one data transmission network (6, 12a, 12b, 15a, 15b, 16, 17) for transmitting information on services in at least one preferably MPEG data transmission stream (TS), in which system:

- the services comprise at least one service component,
- there are means for transmitting services of one or several service\_providers to one or several data transmission networks (6, 12a, 12b, 15a, 15b, 16, 17),
- the service is assigned an identification (original\_network\_id, transport\_stream\_id, service\_id) identifying the service, and
- the service component is assigned an identification (original\_network\_id, transport\_stream\_id, service\_id, event\_id, module\_id, component\_tag) identifying the service component as well as the service to be used for transmitting the service component, wherein the identification data (original\_network\_id, transport\_stream\_id, service\_id, event\_id, module\_id, component\_tag) can serve as a basis for retrieving the data transmission stream (TS) to be used for transmitting the service and the service component, and the location in the data transmission stream (TS), **characterized** in that the system comprises further:
- means for assigning the service and/or the service component identifying name information (service\_provider\_name, service\_name) and
- means for forming a relation between the name information and identification data, wherein on the basis of the name information (service\_provider\_name, service\_name) and the relation it is possible to retrieve the identification data of the service and/or the service component.

12. Broadcasting device (1a, 1b, 1c, 2, 3, 4, 5) for transmitting at least one service in a data communication system comprising at least one data transmission network (6, 12a, 12b, 15a, 15b, 16, 17) for transmission of information in at least one, preferably MPEG data transmission stream (TS), in which data communication system the service is assigned an identification (original\_network\_id, transport\_stream\_id, service\_id), **characterized** in that the device comprises further means (3) for transmitting the name identifying the service (service\_provider\_name, service\_name) and the relation between the name information and the identification data to the data transmission network.

13. Broadcasting device (1a, 1b, 1c, 2, 3, 4, 5) for transmitting at least one service and/or service component in a data communication system comprising at least one data transmission network (6, 12a, 12b, 15a, 15b, 16, 17) for transmission of information in at least one preferably MPEG data transmission stream (TS), in which data communication system:

- the service is assigned an identification (original\_network\_id, transport\_stream\_id, service\_id) identifying the service, and
- the service component is assigned an identification (original\_network\_id, transport\_stream\_id, service\_id, event\_id, module\_id, component\_tag) identifying the service component as well as the service to be used for transmitting the service component,

**characterized** in that the device comprises further means (3) for transmitting the name identifying the service (service\_provider\_name, service\_name) and the relation between the name information and the identification data to the data transmission network.

5    **14.** Receiver (7) for receiving at least one service in a data communication system comprising at least one data transmission network (6, 12a, 12b, 15a, 15b, 16, 17) for transmission of information in at least one, preferably MPEG data transmission stream (TS), in which data communication system the service is assigned an identification (original\_network\_id, transport\_stream\_id, service\_id),  
 10    **characterized** in that the receiver (7) comprises further:

- means (10) for receiving the name information (service\_provider\_name, service\_name) identifying the service as well as the relation between the name information and the identification data, and
- means (10) for finding out the service identification data on the basis of the relation between the name information and identification data.

15    **15.** Receiver (7) for receiving at least one service and/or service component in a data communication system comprising at least one data transmission network (6, 12a, 12b, 15a, 15b, 16, 17) for transmission of information in at least one, preferably MPEG data transmission stream (TS), in which data communication system:

- the service is assigned an identification (original\_network\_id, transport\_stream\_id, service\_id) identifying the service,
- the service component is assigned an identification (original\_network\_id, transport\_stream\_id, service\_id, event\_id, module\_id, component\_tag) identifying the service component and the service to be used for transmission of the service component,

25    **characterized** in that the receiver (7) comprises further:

- means (10) for receiving the name information (service\_provider\_name, service\_name) identifying the service and/or the service component as well as the relation between the name information and the identification data, and
- means (10) for finding out the service identification data on the basis of the relation between the name information and identification data.

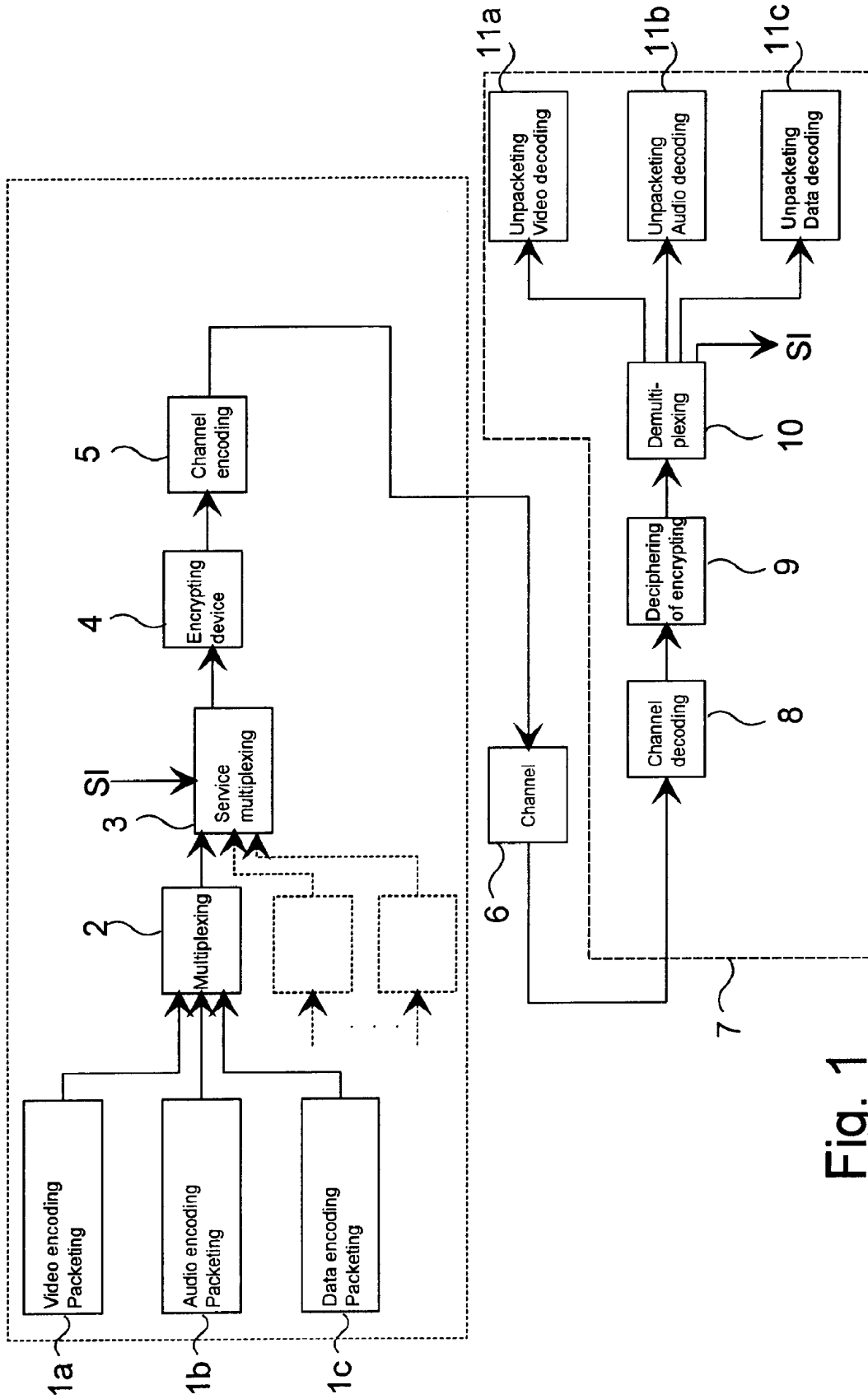


Fig. 1

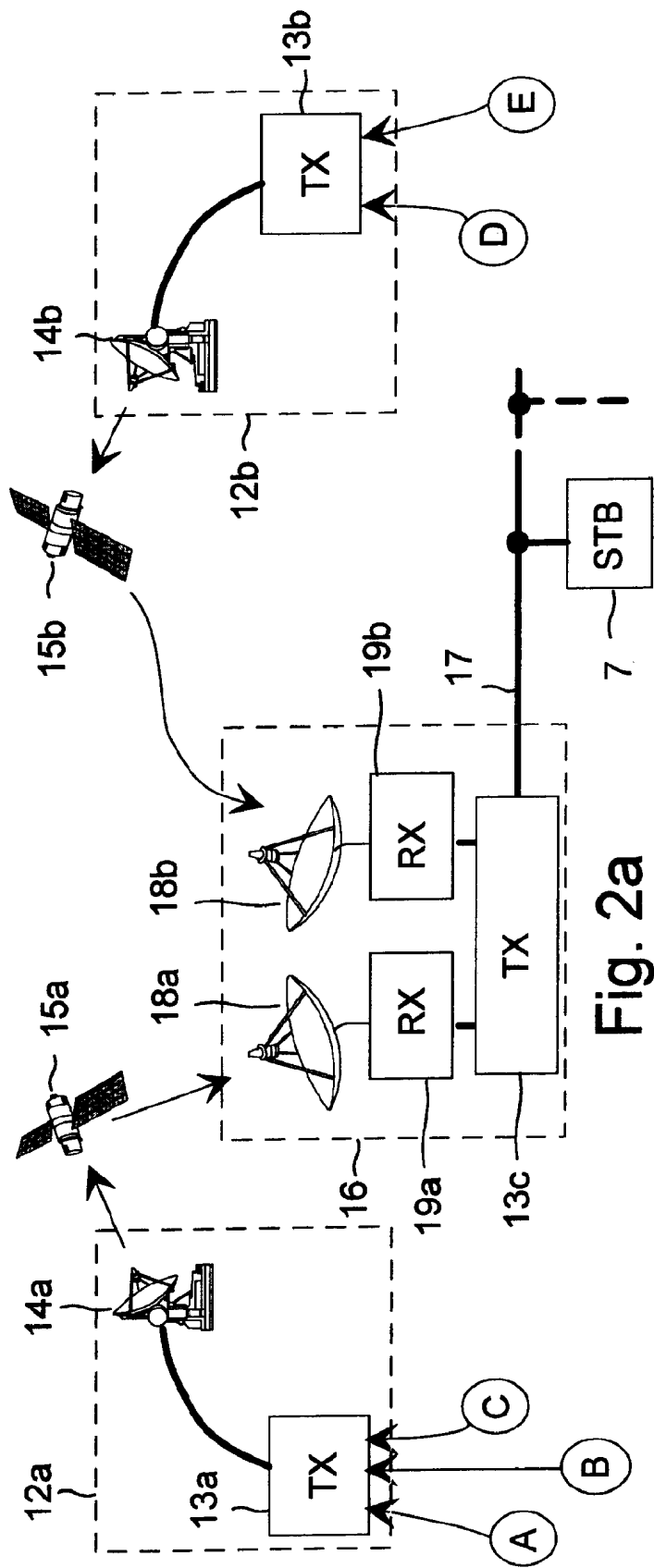


Fig. 2a

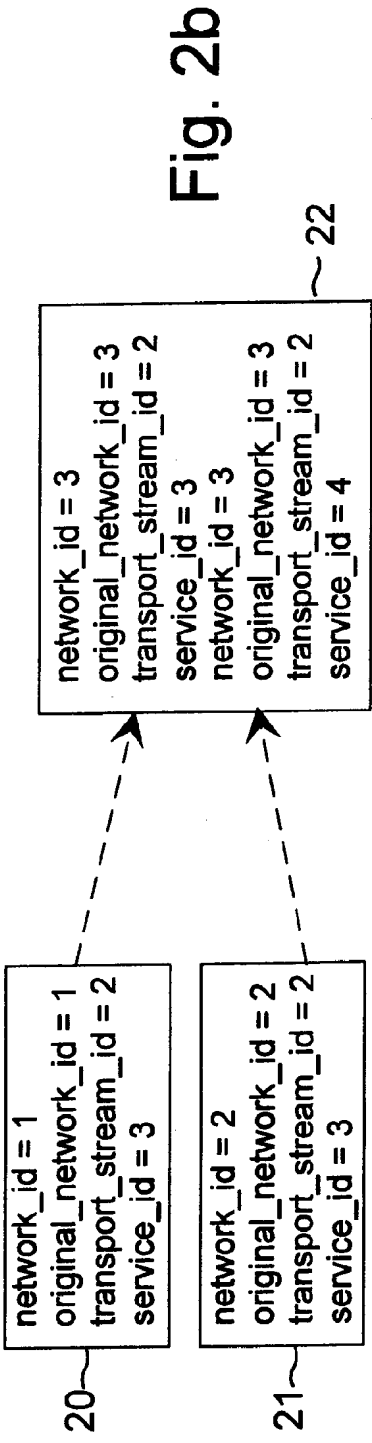


Fig. 2b

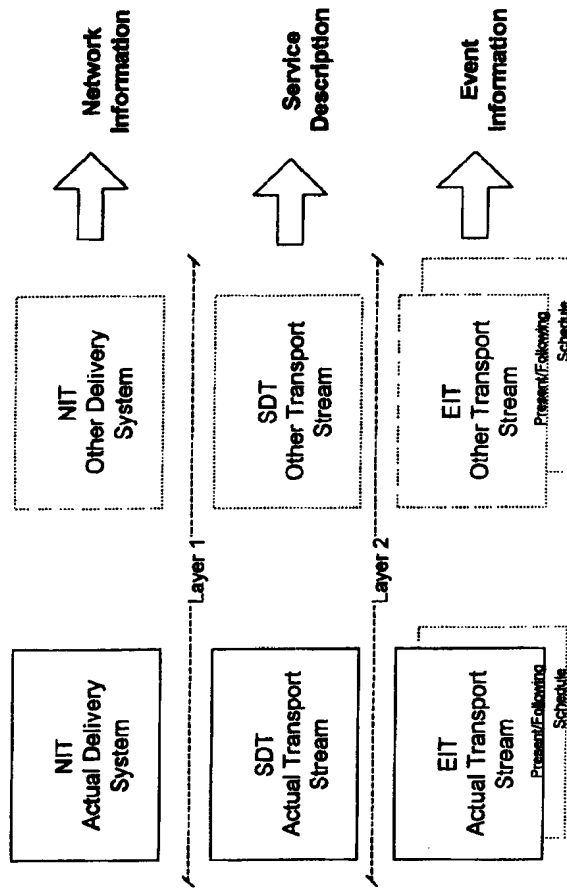


Fig. 3a

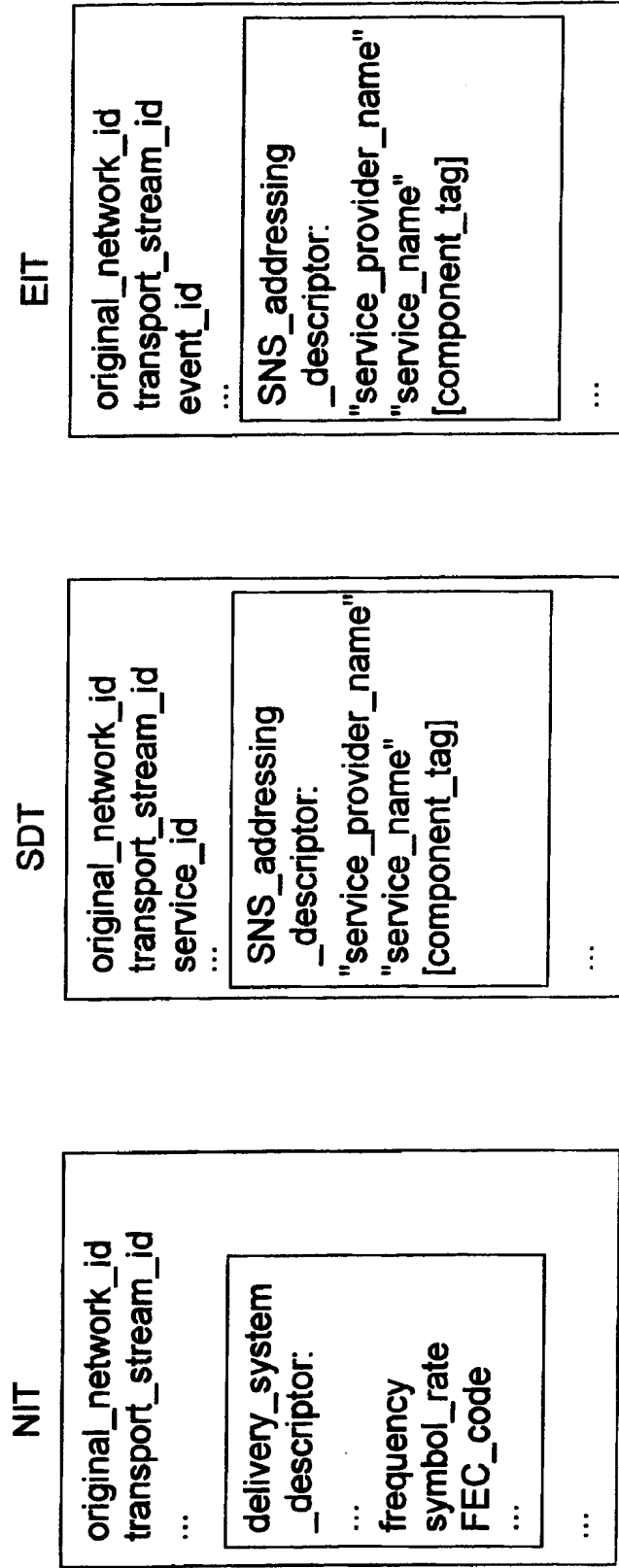


Fig. 3b

Fig. 3c

Fig. 3d

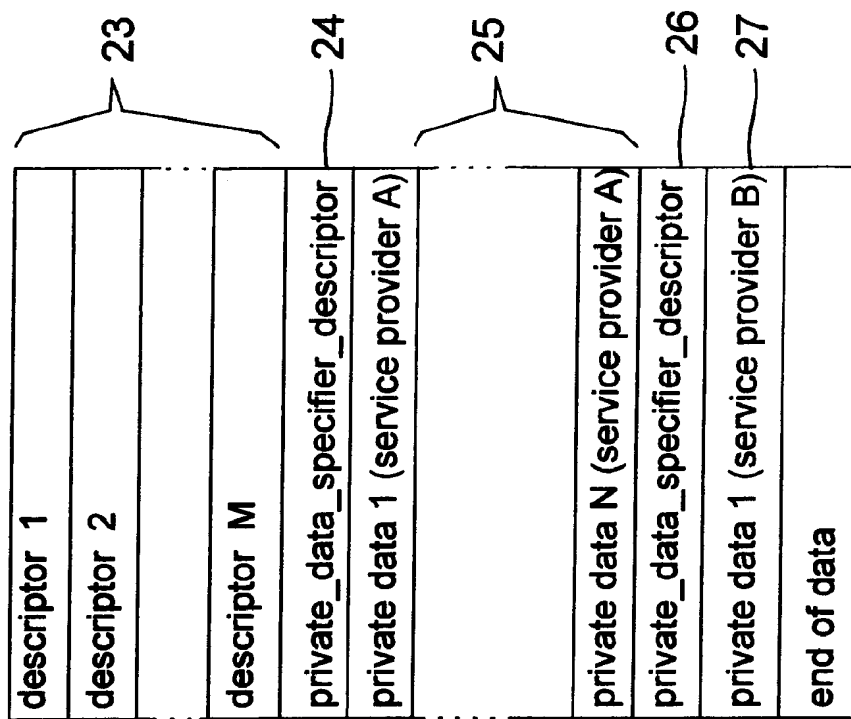


Fig. 4

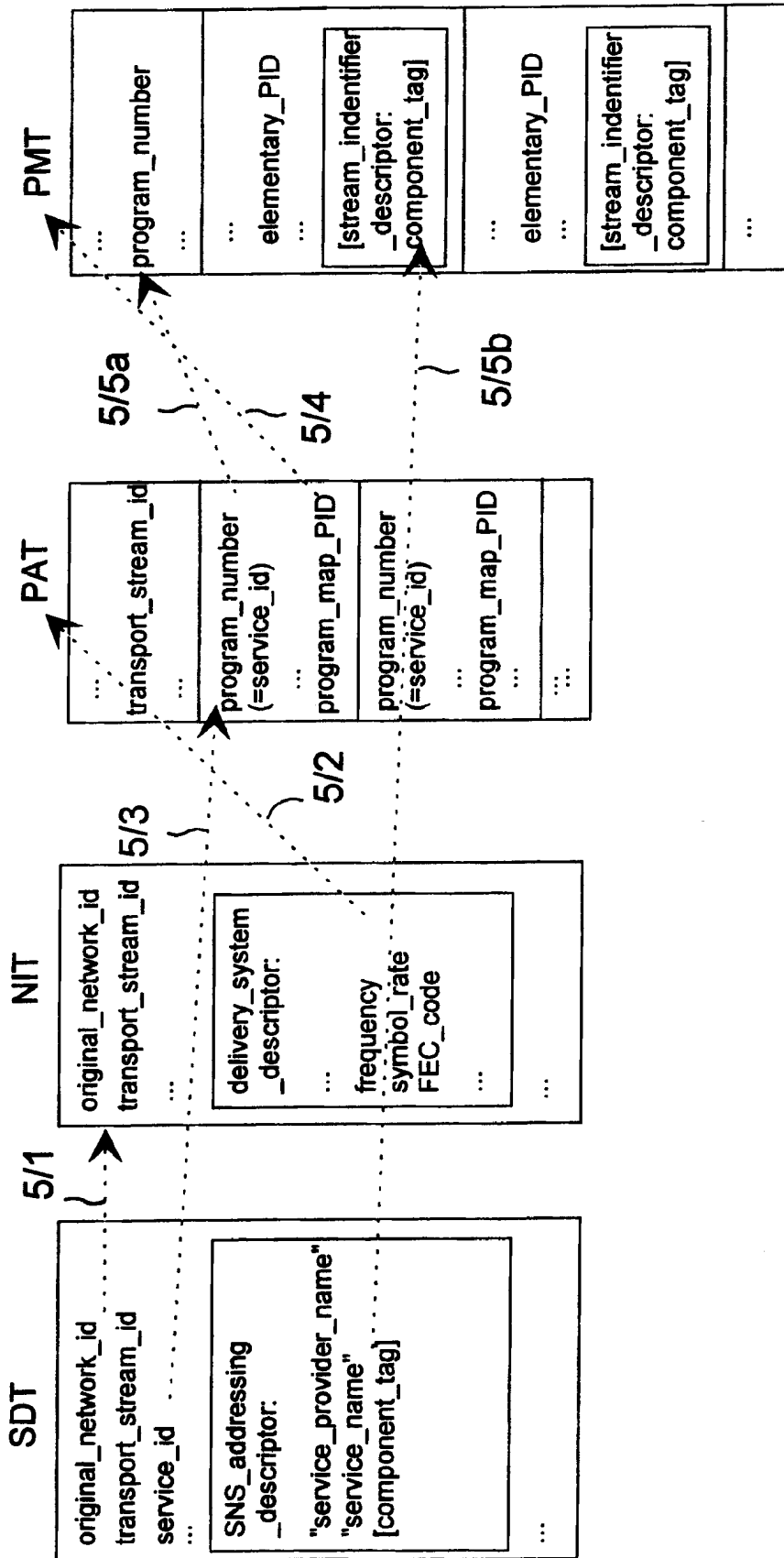


Fig. 5



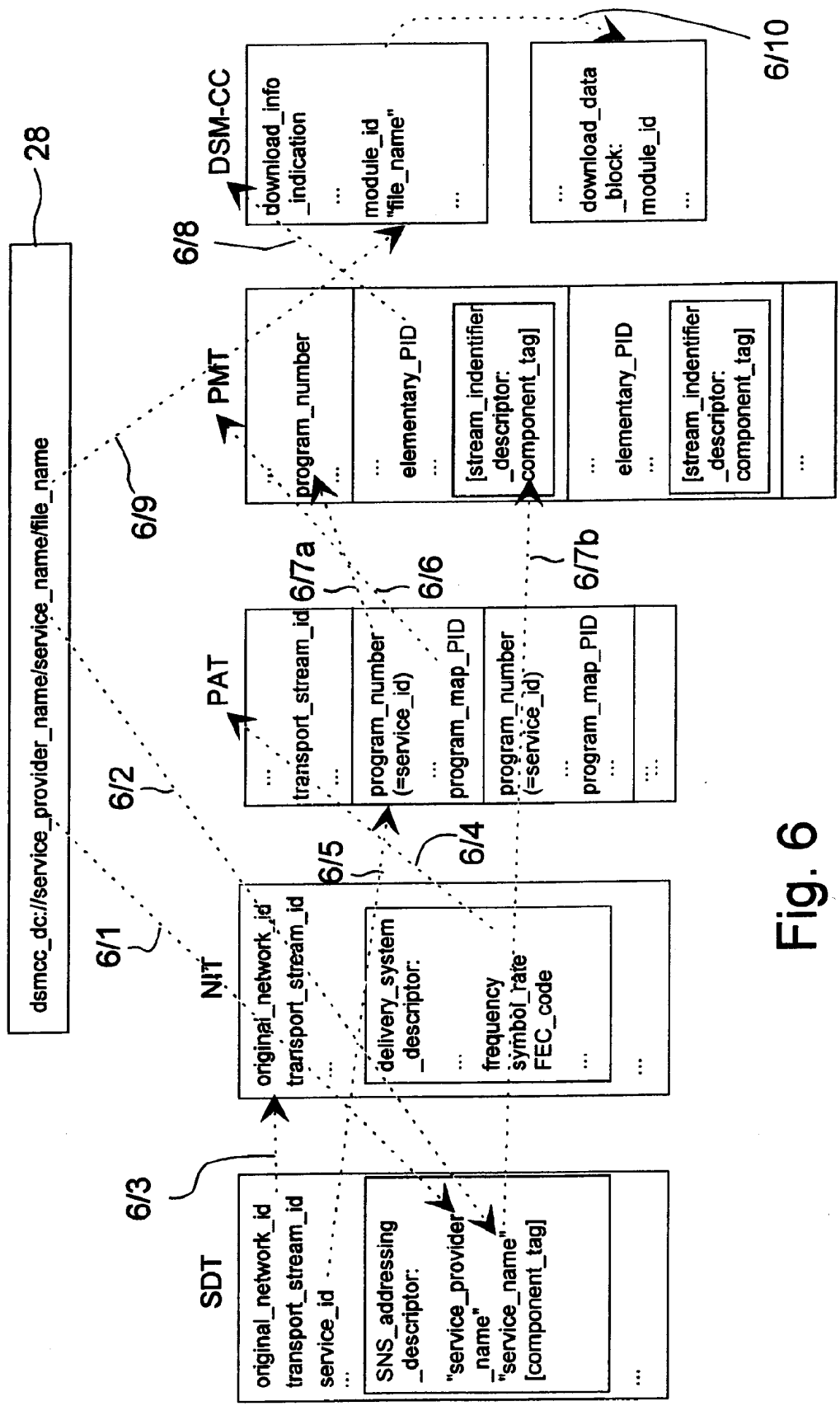


Fig. 6

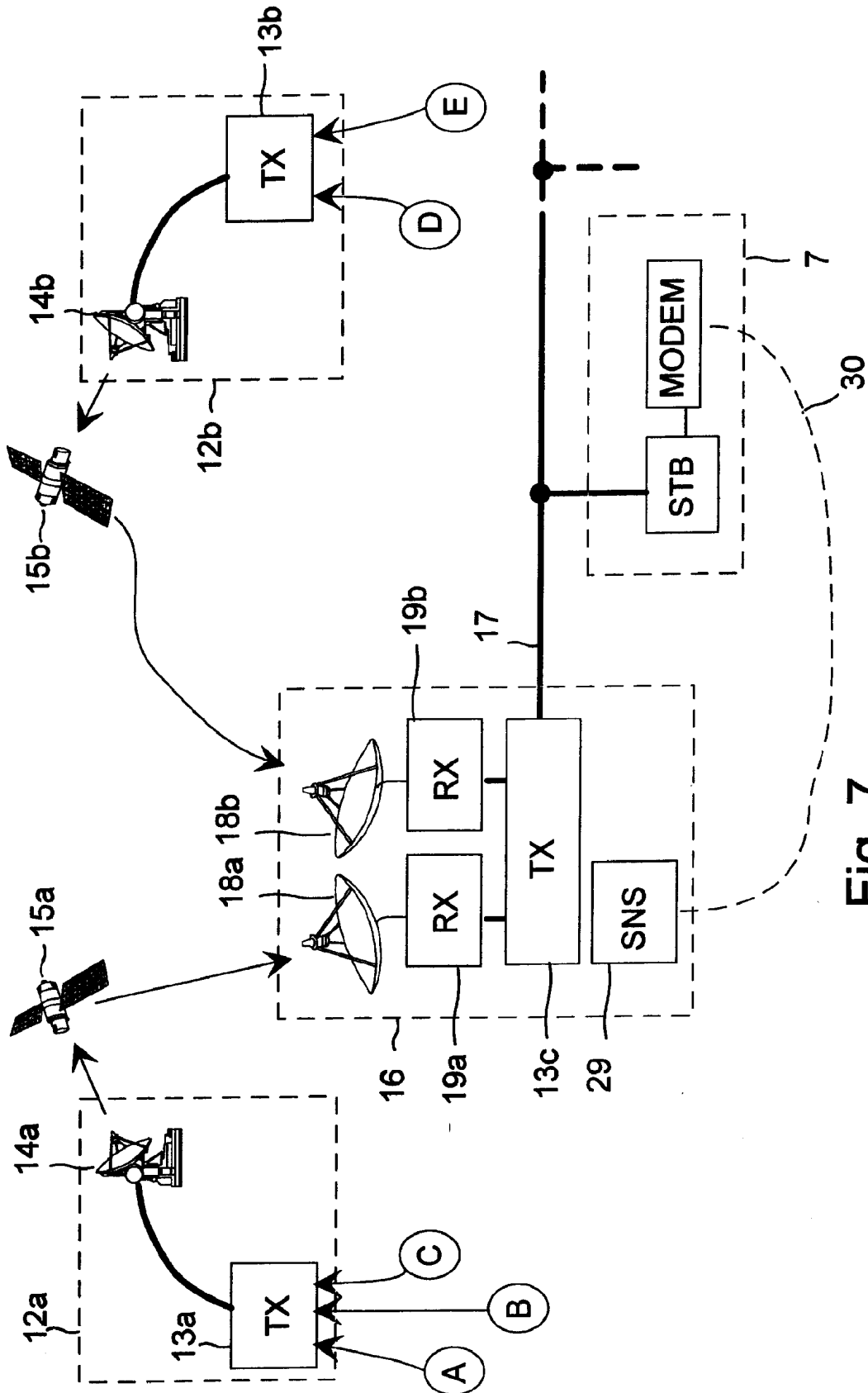


Fig. 7